OIML TC7 SC4 Inquiry Responses on the Revision of R91 *Radar equipment for the measurement of the speed of vehicles*

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TC7 SC4 Composition at the time of the 2010 inquiry (BIML).

Secretariat

UNITED STATES
Dr. Ambler Thompson
Physical Scientist
NIST, National Institute of Standards and Technology
100 Bureau Drive, M/S 2600
Gaithersburg, Maryland - MD 20899-2600
Tel: + 1 301 975 2333Fax: + 1 301 926 0647
Email: ambler@nist.gov

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Countries replying

1. Austria
2. Brazil (O)
3. Cyprus (O)
4. Czech Republic
5. France
6. Germany
7. Netherlands
8. Norway
9. Poland
10. Romania
11. Serbia
12. Spain (O)
13. Sweden
14. Switzerland
15. United Kingdom
16. USA

Inquiry Questions

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I. Country documentation		The Secretariat is interested in whether speed measuring devices are regulated in your country, are they type approved and what the performance specifications are? Please send us your applicable specifications. If they aren't available in English, could your country supply a translation of the metrological and technical requirements? Please attach documents with your reply. The Secretariat has placed appropriate US documents on the OIML TC/SC website and plans to place submitted documents in the same location.	
Country	***Regulated***	***Type Approved***	***Comments***
Australia			Australia is a federation of states with state and federal governments. Responsibility for national technical infrastructure rests with the federal government whilst responsibility for vehicle speed regulation using measuring instruments of the type covered by R91 rests with the state governments and their instrumentalities. As a result of vehicle-speed measuring instruments are not pattern approved in Australia even though the federal government acting through the NMI, provides national pattern approve infrastructure. Further, arising from Australia's constitutional structure and the lack of a suitable up-to-date international pattern approval standard vehicle-speed measuring instruments in use in Australia are subject to an informal state by state approval regime often predicated on legal declarations that certain model of instrument are deemed suitable for use in a particular state.
Austria	X	X	At the moment new regulations for speed meters are in the process of putting into force. Therefore it is not possible to send it because maybe they will be changed after the appraisal.
Brazil	X	X	Speed measuring devices are regulated and type approved in Brazil. The document that contains the metrological and technical requirements was made in 1998, based mainly on the R91. As well as R91, our document is also outdated, especially because in Brazil the technology that prevailed over the years was the inductive loops, representing more than 70% of our approved instruments. We are, at this moment, reviewing our national regulation too, expecting to publish it in 2011. So, the reviewing of R91 can help us a lot, especially with the inclusion of new technologies. The document is not available in English, so we translated it. Some terms used in the translation can cause confusion (in translation is always difficult to pass the original concept of the sentence), but we tried our best.
Cyprus			In Cyprus we do not have any Regulations for a specific type of speedometers. We are preparing technical specifications for speedometers and then we purchase the equipment through a proper process. The specifications are similar to other European Countries that are using the same kind of speedometers.
Czech	X	X	The Czech official document about applicable specification "General Measures - Road

Republic			Speedometers used to monitor observance of the road traffic rules" will be sent soon after be translated to English
France	X	X	The French regulation concerns immediate speed end average speed. Curently, three technologies are deployed: Radar, LASER technology and loops. Due to government decisions, many speedmeters are equipped with digital cameras and are totally automated.
Germany	X	X	In Germany there exist national requirements that cover radar, lidar (typically handheld), laser scanners, inductive loops, pressure sensors (piezoelectric and optical) and light barriers (PTB-A 18.11), requirements on mobile video based speed enforcement (PTB-A 18.3) and on red light surveillance (PTB-A 18.12). 18.11 also contain requirements on digital photo documentation. All requirements are only available in German. [Dr. Ulrich Grottker, PTB-AG8.53, convener TC5/SC2 "Software"]
Netherlands	X	X	----------
Norway		X	There are no laws/regulations of the country concerned in Norway, which comprise by type approval of speedometer equipment. However, the Public Roads Administration (Statens vegvesen in Norwegian) wanted us, Norwegian Metrology Service (Justervesenet in Norwegian), as an independent third party to evaluate their speedometer equipment, Digital Automatic Traffic Surveillance (DATK) - system, according to defined requirements that should give acceptance for use of the system. The Public Roads Administration and The Norwegian Metrology Service made a contractual agreement for DATK-system approval in accordance with: - OIML D11 (Edition 2004): General requirements for electronic measuring instruments - OIML R91 (Edition 1990): Radar equipment for the measurement of the speed of vehicles - WELMEC Guide 7.2: Software Guide (Measuring Instruments Directive 2004/22/EC) - Speedometer equipment technical documentation - EN 61000-6-2: 2005 (EMC immunity for industrial environments) - EN 61000-6-3: 2007 (EMC emission for residential, commercial and light-industrial environments)
Poland	X	X	In Poland the speed measuring instruments for road traffic control are subject to type approval, initial and subsequent verification. The requirements are given in the regulation of the Minister for Economy. The basic requirements given in the regulation are as follows: 1) minimum speed range (30 ÷220) km/h; speed indicated in “km/h”; maximum scale division 1 km/h; 2) the instrument should stop working when the supply voltage is:

			below 90% or above 120% of rated supply DC or AC voltage – for an instrument powered from an external source, below 90% of rated supply voltage – for an instrument powered from an internal source; 3) ambient temperature at least from 0 deg C to +50 deg C; 4) air relative humidity in the range from 20% to 95%; 5) MPEs (type approval, initial and subsequent verification): in reference conditions: ±1 km/h – below 100 km/h, ±1% of the measured value- above 100 km/h in rated working conditions: ±3 km/h – below 100 km/h ±3% of the measured value – above 100 km/h 6) the instrument should be immune to: a) electromagnetic fields being modulated with 1 kHz, 80 % AM sine wave and strength: - 10 V/m in the range 27 MHz ÷ 1 GHz, - 20 V/m in the range 1,4 GHz ÷ 2 GHz; b) electrostatic discharges: - 6 kV – direct contact discharge, - 8 kV – air discharge, - 8 kV – indirect discharge to Vertical Coupling Planes (VCP) and Horizontal Coupling Planes (HCP); 7) the instrument should be immune to electrical fast transient/bursts - positive and negative polarization, duration time of 50 ns and rising time of 10 ns, the peak voltage equals to: 1 kV – at power and grounding connector, 0,5 kV – at signal and control connectors; 8) vibrations - the frequency from 20 Hz to 150 Hz; RMS value of acceleration up to 20 m/s2 for instruments foreseen to be installed and used in moving vehicles. 9) for instruments powered exclusively by DC voltage from internal power sources the tests 6b indent one and two and the test 7 indent one are not applicable.
Romania		X	In Romania, the speed measuring devices are regulated by the Legal Metrology Norm NML 021-05 "Instruments for the measurement of speed of road vehicles (cinemometers)" and are subject to type approval. The metrological and technical requirements are contained in NML 021-05 with subsequent amendments (see our website <www.brml.ro/regulament-764-2008>) . An English translation of this document is not ready available, but will be provided to you in short time.

Spain	X	X	Find attached documents
Serbia	X	X	----------
Sweden	X		The Swedish Police Board is the regulating authority in Sweden. There are two separate regulations; one on radar equipment and one on laser equipment. The provisions are formulated in such a way that all equipment used shall be approved by the authority. The authority then puts the technical requirements in the purchase criteria of the instruments. For radar equipment the technical part of the requirements are based on OIML R 91.
Switzerland	X	X	Legal bases: - “Ordinance for Measuring Systems for Official Speed Checks of the Road Traffic” (SR 941.261) - “Directives for Speed Surveillance of the Road Traffic” addressed at the police for the use - Document OIML D11 (ed. 2004)
United Kingdom	X	X	We think it would be useful to take this opportunity to suggest inclusion of a secondary check reference clearer than the note at the bottom of page 4 of OIML R91. A secondary check for automatic unattended equipment should be included as a desirable if not an essential requirement – see section 5.7.1 of the Speedmeter Handbook. We think therefore there should be a sentence in the main text of the Recommendation, perhaps at the start of section 3.4.2. This could be on the following lines "For automatic unattended operation it is strongly advised to have a second method of speed measurement involving a different principle (such as two images taken a known time apart) for verifying the primary measurement".

II. Subcommittee Representation	
Country	***TC Representative***
Australia	Dr Richard Brittain LLB, Senior Legal Metrology Policy Officer, Legal Metrology Branch, National Measurement Institute, Bradfield Road, West Lindfield, NSW 2070 Australia (postal address PO Box 264 Lindfield, NSW 2070 Australia) ph +612 8467 3645, fax +61 8467 3899, mobile +61 408 617 438, e-mail richard.brittain@measurement.gov.au
Austria	Respondent's contact information - Bernd Sahlender Contact information for TC7/SC4 Representative – bernd.sahlender@bev.gv.at
Brazil	FABIO DE SOUZA LOPES National Institute of Metrology, Normalization and Industrial Quality - INMETRO ADDRESS: Av. N.Sa. das Graças, 50 - Building 11 - Xerém - Duque de Caxias Rio de Janeiro - Brazil - 25250-020 Telephone: + 55 21 2679-9411 Telefax: + 55 21 2679-1761 E-mail: <fslopes@inmetro.gov.br>
Cyprus	Ntinos Hadjiconstantinou (Cyprus´ Representative at CIML and TC7/SC4)
Czech Republic	Pavel Klenovsky, Czech Metrology Institute, Okruzni 31, 638 00 Brno, Czech Republic and Milan Prasil, Czech Metrology Institute, V Botanice 4, 150 72 Prague 5
France	Bernard VAN MARIS
Germany	CIML Member
Netherlands	gteunisse@verispect.nl and pkok@nmi.nl cvmullem@verispect.nl
Norway	and TC7/SC4 Representative: Brit Furnes-Wilkens, email:bfw@justervesenet.no, working adress: Fetveien 99, NO-2007 Kjeller, Norway, Phonenr: +47 64 84 84 84
Poland	Central Office of Measures, ul. Elektoralna 2, 00-139 Warsaw Contact information for TC7/SC4 Representative – Artur Trościanko; tel. +48 22 581 94 97; length@gum.gov.pl
Romania	Romanian Bureau of Legal Metrology, e-mail: office@brml.ro
Spain	Belen Martin (OIML@cem.mityc.es & bmblasco@cem.mityc.es)
Serbia	Mr. Slobodan Zelenika
Sweden	CIML Member

Switzerland	walter.fasel@metas.ch
United Kingdom	(1) Morayo Awosola, NMO, Teddington TW 11 0JZ Tel: + 44 0 208943 7287, Morayo.awosola@nmo.gov.uk. (2a) Stephen R Lewis steve.lewis@homeoffice.gsi.gov.uk Tel +44 (0)1727 816 265 (2b) Ian Humphrey Ian.humphrey@homeoffice.gsi.gov.uk Tel +44 (0)1727 816 391 Home Office Scientific Development Branch (HOSDB), Woodcock Hill, Sandridge, St Albans, Hertfordshire, AL4 9HQ United Kingdom Fax 01727 816233

III. Speed Technologies	**What speed measurement technologies would your country like to see implemented in the R91 revision? Automated and manual?**
Country	***Comments***
Australia	Australia would like R91 to be as technology non-specific as possible to enable it to cover a range of current and emerging technologies, focusing instead on the metrological characteristics that a speed measuring instrument should have rather then the details of the technology. At present the following technologies are employed for vehicle speed measurement in Australia: - Radar instruments - Lidar instruments - Induction loop sensor based instruments - piezoelectric sensor based instruments - fiber optic sensor based instruments
Austria	Radar, Lidar (hand held and scanner), section control, time over distance (light barriers, piezo, inductive loops) automated and manual
Brazil	In Brazil, three technologies are used: surface sensors (inductive loops and piezos), radars and Lidar. These are the technologies that we would like to see implemented, with special attention to inductive loops, that represents our major concerns. Some manufacturers have made us questions about speed measuring by image (the speed is measured based on the vertical difference of their position in consecutive images) or by average speed (the license plates are identified in the beginning and in the end of a highway, for example). Fo us, it's not primordial to include these technologies at this moment, but it's a good opportunity to start the discussion of some new technologies.
Cyprus	The automation technology for measuring speed would be more useful.
Czech Republic	We would like to see implemented both - automated and manual speedometers: - microwave doppler radars - lidars - time/speed (= section)
France	Radar, Laser, loops, including immediate and average speed measurement in both automated and manual configurations
Germany	----------
Netherlands	Both automated and manual systems. In NL radar-, laser- (lidar), vehicle detector- (for example: inductive loops, piezo, light beams) speedmeters and Point to Point systems, named section speed meters in Dutch regulation (average speed over distance; both stationary and mobile) are in use. This might however be too much to include in one and the same Recommendation.
Norway	Time/distance speed measurement and Lidar

Poland	The R91 revision should at least cover radar, lidar and variations of time/distance speed measurement. Automatic as well as operated manually instruments should be included.
Romania	----------
Spain	Automated mainly
Serbia	all three major technologies
Sweden	We suggest to try to keep the R91 document as technology unspecific as possible, i.e. if possible specify requirements on functions rather than on the technology in order to make it easier for development and implementation of new technologies. The R91 document would thus stay valid longer. We believe however that it could be difficult to incorporate other technologies than "transmitting" devices and keep the level of requirements. If technology specific test methods need to be defined, we suggest to put recommendations regarding these in annexes as guides for test-laboratories. We suggest to have both automated and manual equipment included.
Switzerland	Automated- FM-CW Radars, Lidars (laser guns and laser scanner), Barrier speed systems (loop detectors, piezo-systems, laser barrier and optical barrier). We recommend to see all these speed technologies (speed systems) as "black boxes" and to fix only the measurement qualities (maximum measurement uncertainty) for the use of the police (mobile or stationary).
United Kingdom	Both automatic and manual technologies should be covered The automatic technologies should include radar (across the road, over the road & down the road tracking), piezo sensor, inductive loop and distance/time devices The manual technologies should incude radar, laser & distance/time devices Performance specifications are given in HOSDB Handbooks, copies of which are attached. The documents are: • The Speedmeter Handbook (Fourth Edition) publication no 15/05 and amendments Nos 1, 2 and 3 • Automatic Distance/Time Speedmeter Handbook (2nd Edition) Provisional Publication No 02/06 and Erratum No 1 • Manual Distance/Time Speedmeter Handbook Publication No 55/04

IV. Title	**The current title of R91 “Radar equipment for the measurement of the speed of vehicles,” would need to be changed if we include other measurement technologies. I would suggest a more general title of “Speed Measuring Equipment for Traffic Safety.”**
Country	***Comments***
Australia	Australia's legislation talks in terms of 'measuring instruments' so we would prefer a title along the lines of "Vehicle-Speed Measuring Instruments for Traffic Safety". However, we are willing to accept the suggested revised title if it represents a consensus amongst members.
Austria	Traffic Speed Measuring Instruments (but your suggestion is as well)
Brazil	Ok.
Cyprus	The "Speed Measuring Equipment for Traffic Safety" would be better because it covers bigger spectrum of work.
Czech Republic	We agree and support your suggestion
France	----------
Germany	----------
Netherlands	vehicle (or traffic) speed measurement systems
Norway	The Norwegian Metrology Service support the new title.
Poland	The proposed title seems to be acceptable, possibly it could be: “Speed measuring equipment for road traffic control”
Romania	The more general title of "Speed Measuring Equipment for Traffic Safety" suggested by you is more appropriate.
Spain	We would prefer " Speed Meauring systems for Traffic Safety"
Serbia	OK
Sweden	We Agree
Switzerland	accepted!
United Kingdom	We agree that the title should be changed. This would be done most simply by dropping the word “radar” from the existing title, but the suggested new title would also be acceptable.

V. Scope	**The current scope of R91 is inappropriate if we are going to include other technologies. I would suggest:** **"This Recommendation is applicable to all equipment for the measurement of traffic speed on roads. The Recommendation states the metrological performance that the equipment must satisfy when the results of measurement are to be used in legal proceedings. The legal interpretation of the results of measurements, the choice of technology and the conditions under which these instruments may be applied are left to national regulations."**
Country	***Comments***
Australia	Australia's legislation talks in terms of measuring instruments rather than equipment and we believe that the former is more the appropriate term for use in R91.
Austria	sounds good
Brazil	Ok. The only doubt is when you say " … is applicable to all equipment …", because when the word all is used there is no resctrictions, ie all kind of technologies can be included.
Cyprus	It would be better if there are common Regulations for speed measurement equipment and also if there are common specifications for buying specific speedometers in the entire world.
Czech Republic	We agree and support your suggestion
France	----------
Germany	I propose to integrate software requirements as laid down in Document D31 into the revised Recommendations. As you know, it is not enough to only quotate this Document in a Recommendation but it is necessary to adapt the severity level for acceptable technical solutions for the defined software requirements and the appropriate examination level. I am prepared to assist TC7/SC4 in this task, if need be. [Dr. Ulrich Grottker, PTB-AG8.53, convener TC5/SC2 "Software"]
Netherlands	It is suggested to see to it that user manual clearly informs and explains this to the users/operators
Norway	The Norwegian Metrology Service are positive and support the suggested scope.
Romania	----------
Poland	The suggested scope seems to be appropriate, nonetheless taking into account the rapid progress in technology it seems doubtful if the recommendation really will cover "all equipment".
Spain	We agree with the proposal
Serbia	----------
Sweden	A good suggestion, see our comment on "speed technologies"
Switzerland	accepted!

United Kingdom	We agree with this proposed wording.

VI. MPES	**The current MPES in R91 are ±1km/hr or 1% above 100 km/hr.** **This is both for laboratory as well as field testing.**
Country	***Comments***
Australia	Australia is happy to continue with these MPEs, however, in our work on developing a metrolgical control regime for vehicle-speed measuring instruemnts we have been working on the basis of MPEs of + or - 2 km/h up to 100 km/h and + or - 2% above 100km/h. These MPEs were based on considerations or practicality and we are happy to further discuss this matter.
Austria	I suggest the common MPES in Europe: +/- 3 km/h till 100 km/h and +/- 3 % above 100 km/h for field testing and "real use" and +/- 1 km/h till 100 km/h and +/- 1 % above 100 km/h for laboratory tests with simulated signals
Brazil	For laboratory tests, we consider appropriate the current MPES. For field testings, we consider inappropriate that the average error of all measurements is ±1 km/h or 1% above 100 km/h, because our experience shows that if we had adopted this criterion in Brazil, a lot of instruments would not have been approved. In field tests, our only criterion is that no measurement can give an error larger than ±3 km/h. . So, we suggest that average error rises for ±1,5 or ±2 km/h and that the negative error presented by the instrument during the field test must also be considered as a criterion af approval, because we consider the following: no driver can be punished unjustly, but he can not escape punishment if it is deserved. We also suggest greater errors for mobile instruments.
Cyprus	It would be useful if the above term is included in the specifications.
Czech Republic	we would suggest MPEs: ±1 km/h or ±1 % above 100 km/h for laboratory testing and ±3 km/h or ±3 % above 100 km/h for field testing
France	for field testing, MPES seems to be 3 km/h or 3 % in R 91. Restriction of MPES to 1 km/h or 1% does not seem to be very easy to reach with radar or lidar technologies
Germany	----------
Netherlands	Not correct: ±1 km/h below 100 km/h and ± 1% above 100 km/h for laboratory circumstances and ± 3 km/h below 100 km/h and ± 3% above 100 km/h on the road(field conditions)
Norway	Norwegian Metrology Service has used the same limits.
Poland	It seems that MPE equal to ±1km/h is not appropriate for field tests.
Romania	----------
Spain	In our opinion those MPES are too low, the resolution of most of speed meters is 1 km/h and this is just one of the contributions to the uncertainty. Regarding laboratory and field testing MPES, field MPES for fiel tests should be higher than MPES for laboratory test because the number of contributions to the uncertainty is higher. The symbol for the unit of hour is h so it should

	be km/h instead of km/hr.
Serbia	----------
Sweden	OK, should be combined with a maximum positive error, as in current version of R91.
Switzerland	This requirement under Pt. 7.1.3 (R91) is only for testing of the low-frequency section. This check is for today's technologies no more applicable (for ex. Laser, loop detectors etc.)
United Kingdom	The current limits are fine for laboratory tests using simulated inputs. For field testing the limits currently given in 7.3, i.e. out of 500 measurements none shall give a positive error larger than +3km/hr or +3% above 100 km/hr are still appropriate.

VII. Units	**The US specifications for the most part are in miles per hour and several other member states also use this unit. How can we deal with the unit differences so that type approval results are transferable to other nations?**
Country	***Comments***
Australia	Australia believes that the revised R 91 should be in metric (SI) units exclusively i.e. km/h and that the member states seeking to use none metric (SI) units should make their own arrangements with respects to that matter.
Austria	As I see, the recommendations until now deals with km/h or m or km only (R91, R21). I suggest to keep staying inside the SI and to define the MPEs in km/h.
Brazil	No suggestions.
Cyprus	We would like to suggest that in the menu of each speedometer, the user must have the choice of speed measurement, i.e. in kilometers per hour or miles per hour. As regards the transfer of the type approval results to other nations, this could be achieved by stating the conversion factor of km to mile and vice - versa (in revised R91 and the type approval certificates).
Czech Republic	in Europe the type approvals are not generaly accepted between EU countries, so each country makes its own type approval, the unit is km/h
France	Instruments could be able to measure and respect MPES in km/h and in mph, but the choice of the unit of speed should be able to be sealed if it is required according to the national regulation
Germany	----------
Netherlands	The formal SI units will need to be implemented as default. Suggestion: Optional the manufacturer could choose to implement a device (or software) performing conversion to a regional or locally used unit of measurement, but this cannot be considered the legal display. So the SI value will always need to be indicated as well. Furthermore the speed meter needs to be evaluated with sufficient resolution as to be able to convert the readings to the correct unit and to verify compliance to the MPE's. Also verification of the correct calculation of the speed meter when switching units would be necessary
Norway	The Norwegian Metrology Service suggest the more universal metric system.
Poland	The requirements in the US and EU should be as similar as possible. In particular the MPES should be the same regardless of the units they are expressed in.
Romania	----------
Spain	US is signatory of the Meter Convention, the 11th General Conference on Weights and Measures (1960) adopted the name Système International d'Unités (International System of Units, international abbreviation SI), for the recommended practical system of units of measurement. So for the distance km should be used, countries who use mile can easily convert km to mile using the conversion factor.
Serbia	----------

Sweden	We suggest to keep the document with one unit (km/h) but to write/define somewhere in the document that mph may be used and which conversion factor that should be used in that case.
Switzerland	2 mph ~ 3 km/h for speeds < 100 km/h or 60 mph > 100 km/h or 60 mph 3 %.
United Kingdom	We need to continue to use mph because the British speed limits which the devices are used to enforce are set in mph. The Recommendation could simply prescibe equivalences. We use 2 mph instead of 3km/hr, 66mph instead of 100 kph and +/- 1mph for testing with simulated inputs.

VIII. Accuracy Classes	**Currently R91 has a single accuracy class, would there be any benefit to having 2 to 3 accuracy classes, perhaps as multiples of (±1km/hr or 1% above 100 km/hr)?**
Country	***Comments***
Australia	Australia has not approached this matter in terms of accuracy classes. However, based on the fact that R91 has MPE requirments that differ from those under condideration in Australia it may be appropriate to include them in R91 so that the needs of as many members as possible can be covered by R91.
Austria	In my opinion there is no need for more than one class.
Brazil	We don't see benefits having more than 1 accuracy class.
Cyprus	In our opinion, one class of accuracy is enough.
Czech Republic	we support only one accuracy class
France	To avoid the contestings before the law courts, France is not favorable to this opportunity
Germany	----------
Netherlands	May be some open class: NL employs a system in which a maximum MPE is required but allows for the manufacturer to specify a smaller MPE. In that case the reduction ratio for all relevant MPE's is the same; see attached draft NL regulation.
Norway	Maybe for statistical purposes an error limit +- 3 km/hr or 3% above 100km/hr .
Poland	It does not seem reasonable. The would-be offenders should be convinced that the speed is always measured with the same accuracy.
Romania	A single accuracy class would be enough.
Spain	we do not believe there is any need for accuracy classes the main objective is to punish the offenders and this should be done with the best technology available
Serbia	----------
Sweden	Yes, we believe it is a good suggestion. There may be equipment with lower speed accuracy but other qualities. If larger positive errors will be allowed, it should be carefully handled. National regulators then put the accuracy class they need.
Switzerland	For official traffic enforcement only one class! Otherwise a enforcement harmonization (for ex. Project VERA) will be difficult. otherwise: class 1: for speed instrument for complex traffic condition (more than 1 car) class 2: for speed instruments for simple traffic situation (only 1 car in the complete measuring area ± 100 m) for example radar guns

	class 3: for monitoring speed instruments (for technical checks of tachymeter for the road traffic department, etc.
United Kingdom	No, this would introduce unnecessary complexity, confusion and scope for argument over the use of devices falling into different classes. The current limits and a single accuracy class are appropriate.

IX.Technologies	**The secretariat plans to develop the revision of R91 to cover radar, lidar and time/distance measurements. The same metrological requirements will apply to all devices. Technical differences in the devices which are pertinent to the metrological performance of the device will be dealt with in technical requirements sections, for example alignment, cosine effect and time triggers on time/distance measurements. Annexes will cover the basic physics of the technologies.**
Country	***Comments***
Australia	Australia agrees that this it the appropriate way to make R91 technology non-specific and would support revising R91 in this way.
Austria	seems to be a good way
Brazil	Ok.
Cyprus	No comment.
Czech Republic	we agree and support your suggestion
France	----------
Germany	----------
Netherlands	O.K. and additional see the suggested vehicle detector systems
Norway	The Norwegian Metrology Service support this view. We would like the recommendation to focus on functional requirements rather than detailed technical specification.
Poland	It seems like a very good idea.
Romania	The cosine effect, alignment, masking shadowing etc. could be dealt with in the technical documentation of the instrument; the Recommendation could contain a requirement indicating that this information should be included in the handbook
Spain	we agree
Serbia	OK
Sweden	We agree. As we mention above, we suggest to try to keep it as technology unspecific as possible. Hopefully, it will be sufficient with sections with test recommendations for the different technologies. Radar, lidar and time/distance sounds like a good starting point.
Switzerland	accepted!
United Kingdom	Agreed, but we should like included all the technologies referred to in our comments above.

X. Rated Operating Conditions	**From R91(1990)** **Minimum temperature range 0 °C, + 50 °C** **For outdoor installations –20 °C, + 60 °C** **The radio frequency immunity requirements in R91 are clearly outdated. I propose that we specify The instrument shall be subjected to a field strength of 10 V/m in the frequency range 26 MHz - 2 GHz; the signal being modulated with 1 kHz, 80 % AM sine wave. With special attention in cell phone bands, digital radio bands (police and others) and in device under test clock frequencies.**
Country	***Comments***
Australia	*Temperature* Australia is currently considering requiring that for pattern approval vehicle-speed measuring instruents operate over the temperature range of -10 to +50 Celsius however, were are prepred to further consider this. *RFI* Australia would support this but feels that testing should be upto 3 GHz if possible to allow for developmemts in the frequency bands used by mobile phones. At present we are considering compulsory testing over the range 26 to 1400 MHz and up to 3 GHz if possible.
Austria	*Temperature* Additional there could be a requirement for an automatic switch-off if the temperature is out of the allowed range. *RFI* In Austria and as I know in Germany too we test with a field strength of 20 V/m.
Brazil	*Temperature* In Brazil, there is no different ranges for indoor or outdoor instalations and the limits are -10ºC and +55ºC. *RFI* OK
Cyprus	*Temperature* We agree with the temperature range as mentioned above. *RFI* Each type of speedometer should be tested for interference from other appliances as radios, mobile telephones, etc, before is

	given for use.
Czech Republic	*Temperature* ---------- *RFI* We agree and support your suggestion with one exception of field strenght - we prefer 20 V/m
France	*Temperature* the French national regulation requires -20 °C, + 60 °C or - 10 , + 50 °C with specifications of use *RFI* ----------
Germany	----------
Netherlands	*Temperature* Keep/stay in line with present/future D11 *RFI* Comment from secretary TC 5/SC 1 (D11) : Update to the latest versions of the applicable IEC standards using OIML D11(together with E5) Implement ESD and conduction related EMC requirements where applicable. Use provided lay-out from D11. D 11 is in revision now and especially the immunity to RF electromagnetic fields needs to be amended. Note that specifically when observing the present version of the referred IEC 61000-4-3 (published in 2006) one will detect that the frequency band for testing is extended to 6 GHz. Above 1 GHz the tests shall be limited to those ranges which need special attention. In Annex G of the standard a number of frequency bands of interest is specified. Moreover in the (draft) Technical report IEC 61000-2-5 Ed.2 an inventory is made on EM environments. This report could perhaps be useful mainly for selecting frequency bands although it has not yet reached its final stage. At present there is a general consensus on setting the exposure level to 10 V/m and the manner (AM 1kHz sine) and intensity (80%) of modulation. It is suggested to closely watch the proceedings of the documents mentioned.
Norway	*Temperature* The Norwegian Metrology Service suggests a temperature range from -40 degrees Celsius to +60 degrees Celsius. *RFI* Emission should also be considered.
Poland	*Temperature* the required minimum temperature range should depend on the country where the equipment is to be used *RFI* According to Polish regulation in the frequency range 1,4 GHz – 2 GHz the required field strength is 20 V/m.
Romania	----------

Spain	*Temperature* we agree with the proposal *RFI* ecause conducted interferences happen at low frequencies, two different tests should be established, one conducted inmunity from 0,15 MHz to 80 MHz and the other radiated immunity from 80 MHz to 2 GHz among other requirements.
Serbia	----------
Sweden	*Temperature* Are these requirements valid for both automatic fixed equipment and for hand-held manual? An option is that the manufacturer states the temperature range, and the system is tested against that. Or that different options are given, like it was suggested for speed accuracy. As an example Sweden needs -40 C, +40 C for outdoor installations. *RFI* We suggest to look at OIML D11 and use applicable requirements/severity levels from that document.
Switzerland	*Temperature* accepted! At -20 ° the cold measurement instrument should start again autonomous and after a warm-up time begin to measure. At 60 ° no overheating in 24 h for fixed installed measurement systems. Including humidity requirements (D11 [10.2]). *RFI* from 80 MHz – 1 GHz 20V/m, from 1.4 GHz – 2.0 GHz 20 V/m, from 2.0 GHz – 2.7 GHz 10 V/m [mod. 1 kHz, 80 %]
United Kingdom	*Temperature* Generally we are concenred with outdoor installations. The UK and other European countries have agreed that the appropriate range would be -10°C to +50°C with condensing humidity. For systems with parts used in an office environment +5°C to +40°C with non condensing humidity would be appropriate. *RFI* We use 10V/m from 80MHz to 2 GHz and conduct immunity tests from 27 MHz to 100MHz to level 2 of EN 61000-4-6. We use 90% modulation although we accept 80% is used by most countries. We do however use different modulation depending on the technology. We default to 1kHz sine wave when that is not warranted. We use sinusoidal modulation for radar at a Doppler frequency corresponding to a different speed than the speed simulator frequency, normally corresponding to a simulated speed of 30mph and modulation frequency corresponding to the Doppler frequency for 40mph. With systems using piezo sensors square wave modulation is used with the timing period corresponding to pulse width expected from the sensor. We also require a non-standard test signal to test for immunity from Tetra radio used by the police. We would suggest some provision allowing a non standard immunity test from operator's radios

XI. Simulators	**Laboratory testing for influence factors and interferences should be done with simulators. Field testing of devices should be done in comparison with certified speed measurement devices. The uncertainty of simulators and outdoor references should be 1/3 of the required MPES.**
Country	***Comments***
Australia	Australia would support this approach.
Austria	Do you mean the extended uncertainty (k=2)? If yes than I agree.
Brazil	Regarding the uncertainty, ok. We suggest that new R91 contains a section defining the basic characteristics of the simulator apporiate to each technology. Our major problem is with lidar instruments. In many cases, we used the distance as reference for laboratory tests, but there is no defined errors for approval/disapproval using distance.
Cyprus	The Cyprus Police has only speed simulator. Speed simulator checks speedometers after being repaired by the Police Technical Department. As regards the uncertainty of simulators and outdoor references, we agree that this should be 1/3 of the required MPES.
Czech Republic	we agree and support your suggestion. We use for the field tests measuring car with GPS speedometer (0,2 km/h uncertainty).
France	----------
Germany	----------
Netherlands	According to OIML D11 laboratory tests should be done as much as possible on the complete measurement instrument. Only in case this is not possible a validated simulation method could be used instead of those parts of the measurement system that cannot be realized in the laboratory. Beware that especially for EMC tests all wiring and even layout of wiring can be of high influence to the possible sensitivity for this kind of disturbances. Furthermore suggested not to specify uncertainty, but to limit uncertainty like "the uncertainty in the simulated metrological quantity value and outdoor references shall be less than 1/3 of the required MPES".
Norway	----------
Poland	Not more than 1/3 of the required MPES seems to be satisfactory.
Romania	----------
Spain	We agree with this statement and this is one of the reasons why MPES should be higher than 1 km/h
Serbia	----------
Sweden	It could be hard to find outdoor references with that accuracy.
Switzerland	accepted!

United Kingdom	Agreed in principle. Since we prescribe units in mph and MPES of 2mph, this means this is 2/3 mph. We have chosen to make this 1mph to be an integer in our units of measurement.

XII. Field Tests	It is recommended that the metrological tests be completed by an operating test in actual traffic. This overall study of possible errors seems indispensable due to the complexity of factors affecting the result of a measurement (shape of antenna lobe, lateral distance between radar and passing vehicle, reflection characteristics of the latter, change of lane during passage through beam, braking, delays in measurement due to the presence of more than one vehicle, etc). The error distribution shall be determined under conditions of variable speed and traffic density, and if possible at various temperatures. The average error of all results shall be within ± 1 km/h. For pattern approval, 500 measurements shall be made, of which none shall give a positive error larger than + 3 km/h (or + 3 % at speeds above 100 km/h). Results that are recognizable as faulty by any user familiar with the handbook shall be discounted. If fewer measurements are made, they are to be considered as a sample which, by its result, shall validate the same error limits as would 500 measurements. For autonomous radars, the results shall confirm the level of confidence required (see point 2.7). The measuring system used for comparison shall have an uncertainty better than one third of that of the radar under test; 99.8 % of its results should have errors that are within ± 1 km/h (or ± 1 % at speeds above 100 km/h).”
Country	***Comments***
Australia	Australia would like to further discuss these requirements as part of the revision of R91, however, we have not included such testing in our draft pattern approval standard and the availability of a comparison measuring system with an uncertainty of better than one third of the measuring instrument under test may be hard to realise in practice.
Austria	Why do you define only a positive error for the field test? I suggest to include the negative one too (see MPEs). Again the question to the uncertainty (k=2 or not?).
Brazil	OK
Cyprus	No comment.
Czech Republic	We do the described field test during type approvals but we can imaginate that now the most advanced methods could be used (e.g. we have a good experience using the lidar LTI simulator LSMS)
France	----------

Germany	----------
Netherlands	Requirements are still adequate; Uncertainty is insufficiently defined. Some general used probablility statement needs to be added.
Norway	In the sentence "The average error of all results shall be within +- 1 km/h" Relative to which referance?
Poland	The requirements named-above seem to be still appropriate with respect to radar equipment only. Supposedly they should be changed if they are to refer to other equipment. As an example making 500 measurements for testing time/speed equipment does not seem justified. Possibly field tests could be different for various type of equipment.
Romania	----------
Spain	It could be considered appropriate with some remarks. For autonomous speedmeters it two pictures of the vehicle offender are needed in order to assure the measurement.
Serbia	----------
Sweden	We believe the requirements are generally ok, but the text needs to be updated to include other measurement techniques.
Switzerland	due to the presence of more than one vehicle, etc). *The maximum measurement uncertainty over the different speed section has to be checked under worse case traffic situation on the road or with significant HF-Simulation!* The error distribution shall be determined under conditions of variable speed and traffic density, and if possible at various temperatures. *The influence of the temperature and humidity and with critical EMC disturbances can only be checked in the temperature chamber or EMC chamber under simulation condition.* The average error of all results shall be within ± 1 km/h. *The mean deviation in the different speed section shall be: -1.5 % ≤ m ≤ 0.5 %. (Because round down of the output speed value to 1 km/h.* For pattern approval, 500 measurements shall be made, of which none shall give a positive error larger than + 3 km/h (or + 3 % at speeds above 100 km/h). Results that are recognizable as faulty by any user familiar with the handbook shall be discounted. *Expanded error limits:* *Test condition (on the road or with simulation)*

	Speed variation of the measured vehicle is < 1 % *The traffic condition shall consider all categories of vehicles types* *(motorcycles, small and long cars, lorries, trucks, tractor-trailer, etc.* *The speed system shall be able to measured speed values* *Mean deviation: -1.5 % <= m <= 0.5 %.* *Standard deviation: s < 0.8 %.* *m + 3 x s < 3 %* *No value with a positive error larger than + 3 km/h (or + 3 % at speeds above 100 km/h).* *Additional tests:* *The speed system shall be able to distinguish 2 vehicles in near position to each other and with small different speeds.* If fewer measurements are made, they are to be considered as a sample which, by its result, shall validate the same error limits as would 500 measurements. *These checks shall be done for both speed detection directions and for every antenna sensitivity.* For autonomous radars, the results shall confirm the level of confidence required (see point 2.7). The measuring system used for comparison shall have an uncertainty better than one third of that of the radar under test; 99.8 % of its results should have errors that are within ± 1 km/h (or ± 1 % at speeds above 100 km/h).” Comments and suggestions - ***accepted!***
United Kingdom	We think that the field test requirements will need to be discussed for further development because vehicle and radar speed tecnology has changed significantly in the last decade. The necessary requirements can be developed during technical committee discussions and the development stages of the drafts.

XIII. Document Development Volunteers	
Country	***Comments***
Australia	Dr Richard Brittain LLB Science (physics including measurement of time), electrical engineering, legal metrology, policy and law - chartered engineer and scientist and lawyer of the Supreme Court of NSW, current practicing certifcate as a solicitor and barrister in NSW.
Austria	----------
Brazil	FABIO DE SOUZA LOPES Substitute of the Head of Division of Measuring Instruments of Length and Force of INMETRO/BRAZIL
Cyprus	Due to the fact that we have not the appropriate expertise in the relevant field, we do not feel that we can participate in this work.
Czech Republic	Milan Prasil, Czech metrology institute, V Botanice 4, 150 72 Prague 5, mprasil@cmi.cz, gsm: +420 733 696 109 in speed measurements
France	----------
Germany	----------
Netherlands	gteunisse@verispect.nl and pkok@nmi.nl and Ted Janssen Senior Advisor Gatsometer bv Claes Tillyweg 2 2031CW Haarlem The Netherlands GSM +31 654977917 e-mail: ted@gatso.nl Teunisse: over 25 years of experience in EMC measurement and testing and D11 aspects; Kok : over 20 years experience in type examination and verification of speed meters for enforcement Janssen: over 40 years of experience of developing, and giving instructions, training and presentations. Homologations/approvals worldwide and expert witness in court for the various types of speed and red light enforcement

	equipment.
Norway	Brit Furnes-Wilkens, email: bfw@justervesenet.no, Working Address: Fetveien 99, NO-2007 Kjeller, Norway, Phonenr: +47 64848484,
Poland	----------
Romania	----------
Spain	Belen Martín Agustín Falcón
Serbia	----------
Sweden	Therese Berg Sensys Traffic AB Mail: therese.berg@sensys.se Direct: +46 36 44 20 230 Mobile: +46 722 327 230 Automatic enforcement equipment based on down-the-road radar technology.
Switzerland	walter.fasel@metas.ch
United Kingdom	(1) Stephen R Lewis steve.lewis@homeoffice.gsi.gov.uk Tel +44 (0)1727 816 265 (2) Ian Humphrey Ian.humphrey@homeoffice.gsi.gov.uk Tel +44 (0)1727 816 391 Home Office Scientific Development Branch (HOSDB), Woodcock Hill, Sandridge, St Albans, Hertfordshire, AL4 9HQ United Kingdom Fax 01727 816233